What is claimed is:

1. A ligand binding to the hypusine region of eukaryotic intiation factor 5A, said hypusine region comprising residues 35 to 65 of the human eIF-5A amino acid sequence as in SEQ ID NOs: 1 and 2, wherein the binding of said ligand in biological samples results in a detectable signal for identification of hypusine-containing eIF-5A and its hypusine-containing fragments.

2. The ligand of claim 1, wherein said ligand comprises an antibody, or an eIF-5A-binding derivative or fragment thereof, and wherein said antibody recognizes a hypusine containing eIF-5A molecule, and binds to a hypusine-deficient eIF-5A molecule in an amount of up to about 5% of the extent of binding to the hypusine-containing eIF-5A molecule.

3. The ligand of claim 2, wherein said ligand specifically binds to a human hypusine-containing eIF-5A molecule, and wherein said binding occurs if said human eIF-5A contains hypusine.

4. A method for distinguishing proliferating cells from non-proliferating cells in a specimen of biological fluid or tissue, said method comprising:
    a. Processing a specimen of biological fluid or tissue to yield a mixture of cells, said mixture consisting of proliferating and non-proliferating cells present in the biological fluid or tissue; and
    b. Treating said mixture of cells with a fixing agent to permeabilize and fix said cells; and
    c. Reacting the cells with a ligand of claim 1, wherein said ligand specifically binds to the hypusine-containing region of eIF-5A; and
    d. Separating said cells from unreacted ligand of step c; and
    e. Detecting said ligand remaining within the fixed cells, whereby detection of said ligand is accomplished by use of a reagent selected from the group consisting of a radiolabel, an enzyme, a chromophore and a fluorescer,
    wherein the detecting of said ligand indicates the presence of proliferating cells.

5. The method of claim 4, further comprising depositing said specimen on a solid support and detecting the ligand within the cells of said specimen, wherein said detecting is accomplished using a microscope.

6. The method of claim 4, further comprising maintaining said specimen in suspension and detecting the ligand within the cells of said specimen, wherein said detecting is accomplished using a flow cytometer.

7. A method for distinguishing proliferating cells from non-proliferating cells in a specimen of biological fluid or tissue, said method comprising:

a. Processing a specimen of biological fluid or tissue to yield a mixture of cells, said mixture consisting of proliferating and non-proliferating cells present in the biological fluid or tissue; and
b. Treating said mixture of cells with a fixing agent to permeabilize and fix said cells; and
c. Reacting said cells with a ligand of claim 2, wherein said ligand recognizes the hypusine containing region of eIF-5A; and
d. Separating said cells from unreacted ligand of step c; and
e. Detecting said ligand remaining within the fixed cells, whereby detection of said ligand is accomplished by use of a reagent selected from the group consisting of a radiolabel, an enzyme, a chromophore and a fluorescer,
wherein the detecting of said ligand indicates the presence of proliferating cells.

8. The method of claim 7, further comprising depositing said specimen on a solid support and detecting the ligand within the cells of said specimen, wherein said detecting is accomplished using a microscope.

9. The method of claim 7, further comprising maintaining said specimen in suspension and detecting the ligand within the cells of said specimen, wherein said detecting is accomplished using a flow cytometer.

10. A method for distinguishing proliferating cells from non-proliferating cells in a specimen of biological fluid or tissue, said method comprising:

a) Processing a specimen of biological fluid or tissue to yield a mixture of cells, said mixture consisting of proliferating and non-proliferating cells present in the biological fluid or tissue; and

b) Treating said mixture of cells with a fixing agent to permeabilize and fix said cells; and

c) Reacting said cells with a ligand of claim 3, wherein said ligand recognizes the hypusine containing region of eIF-5A; and

d) Separating said cells from unreacted ligand of step c; and

e) Detecting said ligand remaining within the fixed cells, whereby detection of said ligand is accomplished by use of a reagent selected from the group consisting of a radiolabel, an enzyme, a chromophore and a fluorescer, wherein the detecting of said ligand indicates the presence of proliferating cells.

11. The method of claim 10, further comprising depositing said specimen on a solid support and detecting the ligand within the cells of said specimen, wherein said detecting is accomplished using a microscope.

12. The method of claim 10, further comprising maintaining said specimen in suspension and detecting the ligand within the cells of said specimen, wherein said detecting is accomplished using a flow cytometer.

13. A method of diagnosing a hyperproliferative disorder comprising contacting a biological sample with a ligand of claim 1 and detecting said ligand bound to eIF-5A in the sample, wherein the detection of ligand bound to hypusine containing eIF-5A is indicative of a hyperproliferative disorder.

14. A method of diagnosing a hyperproliferative disorder comprising contacting a biological sample with a ligand of claim 2 and detecting said ligand bound to hypusine-containing eIF-5A in the sample, wherein the detection of ligand bound to hypusine-containing eIF-5A is indicative of a hyperproliferative disorder.

15. A method of diagnosing a hyperproliferative disorder comprising contacting a biological sample with a ligand of claim 3 and detecting said ligand bound to hypusine-containing

eIF-5A in the sample, wherein the detection of ligand bound to hypusine-containing eIF-5A is indicative of a hyperproliferative disorder.

16. A method of diagnosing intraepithelial neoplasia comprising contacting a biological sample with a ligand of claim 1 and detecting said ligand bound to hypusine-containing eIF-5A in the sample, wherein the detection of ligand bound to hypusine-containing eIF-5A is indicative of local neoplasia.

17. A method of diagnosing intraepithelial neoplasia comprising contacting a biological sample with a ligand of claim 2 and detecting said ligand bound to hypusine-containing eIF-5A in the sample, wherein the detection of ligand bound to hypusine-containing eIF-5A is indicative of local neoplasia.

18. A method of diagnosing intraepithelial neoplasia comprising contacting a biological sample with a ligand of claim 3 and detecting said ligand bound to hypusine-containing eIF-5A in the sample, wherein the detection of ligand bound to hypusine-containing eIF-5A is indicative of local neoplasia.

19. A method of diagnosing intraepithelial neoplasia comprising contacting a biopsy containing epithelium with a ligand of claim 1 and detecting any of said ligand bound to hypusine-containing eIF-5A in the sample, wherein the detection of ligand bound to hypusine-containing eIF-5A is indicative of local neoplasia.

20. A method of diagnosing intraepithelial neoplasia comprising contacting a biopsy containing epithelium with a ligand of claim 2 and detecting any of said ligand bound to hypusine-containing eIF-5A in the sample, wherein the detection of ligand bound to hypusine-containing eIF-5A is indicative of local neoplasia.

21. A method of diagnosing intraepithelial neoplasia comprising contacting a biopsy containing epithelium with a ligand of claim 3 and detecting any of said ligand bound to hypusine-containing eIF-5A in the sample, wherein the detection of ligand bound to hypusine-containing eIF-5A is indicative of local neoplasia.

22. A method for determining in a biological sample the concentration of hypusine containing eIF-5A and/or its hypusine-containing fragments, wherein the hypusine region of said protein is located on residues 35 to 65 of the human eIF-5A as in SEQ ID NOs: 1 and 2, comprising:

    a) contacting said sample with a ligand of claim 1, under conditions wherein said ligand can form a complex with hypusine contained in the sample either as a free amino acid or bound within the hypusine region of eIF-5A or its fragments; and

    b) determining the amount of hypusine-containing antigen bound by said ligand by detecting the amount of complex formed, wherein said detecting is accomplished by use of a reagent selected from the group consisting of a radiolabel, an enzyme, a chromophore and a flourescer.

23. A method for determining in a biological sample the concentration of hypusine containing eIF-5A and/or its hypusine-containing fragments, wherein the hypusine region of said protein is located on residues 35 to 65 of the human eIF-5A as in SEQ ID NOs: 1 and 2, comprising:

    a) contacting said sample with a ligand of claim 2, under conditions wherein said ligand can form a complex with hypusine contained in the sample either as a free amino acid or bound within the hypusine region of mature eIF-5A or its fragments; and

    b) determining the amount of hypusine-containing antigen bound by said ligand by detecting the amount of complex formed, wherein said detecting is accomplished by use of a reagent selected from the group consisting of a radiolabel, an enzyme, a chromophore and a flourescer.

24. A method for determining in a biological sample the concentration of hypusine containing eIF-5A and/or its hypusine-containing fragments, wherein the hypusine region of said protein is located on residues 35 to 65 of the human eIF-5A as in SEQ ID NOs: 1 and 2, comprising:

    a. contacting said sample with a ligand of claim 3, under conditions wherein said ligand can form a complex with hypusine contained in the sample either as a free

amino acid or bound within the hypusine region of mature eIF-5A or its fragments; and

b. determining the amount of hypusine-containing antigen bound by said ligand by detecting the amount of complex formed, wherein said detecting is accomplished by use of a reagent selected from the group consisting of a radiolabel, an enzyme, a chromophore and a flourescer.

25. A method for inhibiting in a cell the biological activity of the hypusine region of mature eIF-5A that corresponds to amino acid residues 35 to 65 of human eIF-5A as in SEQ ID NOs: 1 and 2, comprising:
    a) introducing into said cell of a patient in need of such treatment a nucleic acid molecule encoding an antibody homologue, or a derivative or fragment thereof; wherein said antibody homologue, derivative or fragment thereof is specifically reactive to the hypusine region of mature eIF-5A; and
    b) wherein said antibody homologue is expressed intracellularly and binds to said hypusine region intracellularly thereby inhibiting the biological activity of the hypusine region of mature eIF-5A.

26. The method of claim 25, wherein the antibody homologue is a single chain Fv fragment.

27. The method of claim 25, wherein the nucleic acid molecule is a recombinant expression vector selected from the group consisting of viral vectors and plasmid vectors.

28. A method of identifying a therapeutic agent that decreases the biological activity of the hypusine region of mature eIF-5A, comprising contacting hypusine-containing eIF-5A with an agent and detecting the binding of an antibody of claim 2 to hypusine-containing eIF-5A, wherein said method is conducted by high throughput screening .

29. A method according to claim 25, wherein the high throughput screening of the biological activity of the hypusine region of mature eIF-5A is directed at cell proliferation.

30. A method according to claim 25, wherein the high throughput screening of the biological activity of the hypusine region of mature eIF-5A is directed at retroviral multiplication.

31. A method of identifying by high throughput screening a therapeutic agent that decreases the biological activity of the hypusine region of mature eIF-5A, comprising contacting hypusine-containing eIF-5A with an agent and detecting the binding of an antibody of claim 3 to hypusine-containing eIF-5A.

32. A method according to claim 31, wherein the high throughput screening of the biological activity of the hypusine region of mature eIF-5A is directed at cell proliferation.

33. A method according to claim 31, wherein the high throughput screening of the biological activity of the hypusine region of mature eIF-5A is directed a retroviral multiplication.

34. A method of identifying by high throughput screening a therapeutic agent that decreases the biological activity of the hypusine region of mature eIF-5A, comprising contacting hypusine-containing eIF-5A with an agent and detecting the binding of an antibody of claim 1 to hypusine-containing eIF-5A.

35. A method according to claim 34, wherein the high throughput screening of the biological activity of the hypusine region of mature eIF-5A is directed at cell proliferation.

36. A method according to claim 34, wherein the high throughput screening of the biological activity of the hypusine region of mature eIF-5A is directed a retroviral multiplication.

37. The method of any of claims 28, 31 or 34 comprising the steps of:
    a) Preparing a quantity of purified hypusine-containing eIF-5A;
    b) Attaching the purified hypusine-containing eIF-5A to a solid support;
    c) Forming a reaction mixture by contacting the hypusine-containing eIF-5A of Step b with a test compound with or without antibody to hypusine-containing eIF-5A under conditions which allow binding of the test compound ;
    d) Washing the mixture of Step c to remove non-bound test compound ;
    e) Detecting the amount of hypusine-containing eIF-5A antibody bound, wherein said detecting may be accomplished by using a second antibody which is labeled with a radioactive isotope or an enzyme or chromophore; and
    f) Comparing the amount of labeled second antibody bound to a sample without test compound; wherein the amount of labeled antibody bound correlates

inversely with the potential of the test compound for decreasing the biological activity of the hypusine region of mature eIF-5A.

38. A method of quantifying the response to proliferation-modifying therapies, said method comprising:

a) obtaining a sample or tissue biopsy from a subject of interest prior to the administration of a proliferation modifier;

b) obtaining a sample or tissue biopsy after cessation of administration of a proliferation modifier;

c) using a ligand according to any of claims 1, 2 or 3 to measure the level of hypusine-containing antigen in said sample or tissue biopsy as reflective of the individual's response to the proliferation modifying therapy; and

wherein the proliferation modifying therapy may consist of administration of cell proliferation inhibitors, such as anti-cancer drugs, or of cell proliferation stimulators exemplified by growth hormone, erythropoietin, and similar molecules.

39. A ligand specific for the folate-binding region of eukaryotic translation initiation factor 5A, wherein said folate-binding region comprises at least one residue motif common to eIF-5A and to the bacterial and human dihydrofolate reductases as shown in Figure 6.

40. The ligand of claim 39, wherein the ligand is selected from the group consisting of an analog of folate, derivatives thereof and fragments thereof, which specifically bind to an eIF-5A molecule only if said eIF-5A contains a folate-binding region.

41. A method for identifying folate derivatives that are inhibitors of proliferation yet do not inhibit folate-dependent enzymes, comprising placing the folate derivatives under investigation in contact with an eIF-5A molecule containing a folate-binding region, and measuring the extent, if any, to which said folate derivatives specifically bind said eIF-5A molecule.

42. The method of claim 41, wherein said folate derivatives under investigation are placed in contact with said eIF-5A molecule containing a folate-binding region, and with the ligand of claim 39, and measuring the extent to which said folate derivatives successfully compete with said ligand for binding with said eIF-5A molecule.

43. A method for inhibiting in a cell the biological activity of the folate-binding region of eIF-5A, said folate binding region comprising residue motifs as set forth in Figure 6, comprising introducing into said cell a low-molecular weight molecule that binds to the folate-binding region of eIF-5A, and thereby inhibits the biological activity of eIF-5A required for cell proliferation.